

CLAIMS

What is claimed is:

- 1 1. A magnetic head having an air bearing surface (ABS), comprising:
2 an antiparallel (AP) pinned layer structure having at least two pinned layers with
3 magnetic moments that are self-pinned antiparallel to each other, the
4 pinned layers being separated by an AP coupling layer;
5 a bias layer spaced apart from the AP pinned layer structure, a magnetic moment
6 of the bias layer being pinned; and
7 a free layer positioned between the AP pinned layer structure and the bias layer;
8 wherein at least one of the pinned layers extends beyond track edges of the free
9 layer in a direction parallel to the ABS.
- 1 2. A head as recited in claim 1, wherein the pinned layer positioned closest to the
2 free layer does not extend beyond the track edges of the free layer.
- 1 3. A head as recited in claim 1, further comprising at least one antiferromagnetic
2 (AFM) layer positioned outside the track edges of the free layer in a direction
3 parallel to the ABS, each AFM layer being for pinning a magnetic orientation of
4 portions of the pinned layer positioned outside the track edges of the free layer.

- 1 4. A head as recited in claim 1, wherein each of the pinned layers extends beyond
2 the track edges of the free layer.

- 1 5. A head as recited in claim 1, further comprising at least one antiferromagnetic
2 (AFM) layer positioned outside the track edges of the free layer in a direction
3 parallel to the ABS, each AFM layer being for pinning a magnetic orientation of
4 portions of the pinned layer closest thereto and positioned outside the track edges
5 of the free layer.

- 1 6. A head as recited in claim 1, wherein the head forms part of a GMR head.

- 1 7. A head as recited in claim 1, wherein the head forms part of a CPP GMR sensor.

- 1 8. A head as recited in claim 1, wherein the head forms part of a CIP GMR sensor.

- 1 9. A head as recited in claim 1, wherein the head forms part of a tunnel valve sensor.

- 1 10. A magnetic head having an air bearing surface (ABS), comprising:
2 an antiparallel (AP) pinned layer structure having at least two pinned layers with
3 magnetic moments that are self-pinned antiparallel to each other, the
4 pinned layers being separated by an AP coupling layer; and
5 a free layer positioned towards the AP pinned layer structure;

6 wherein at least one of the pinned layers extends beyond track edges of the free
7 layer in a direction parallel to the ABS.

1 11. A head as recited in claim 10, wherein the pinned layer positioned closest to the
2 free layer does not extend beyond the track edges of the free layer.

1 12. A head as recited in claim 10, further comprising at least one antiferromagnetic
2 (AFM) layer positioned outside the track edges of the free layer in a direction
3 parallel to the ABS, each AFM layer being for pinning a magnetic orientation of
4 portions of the pinned layer positioned outside the track edges of the free layer.

1 13. A head as recited in claim 10, wherein each of the pinned layers extends beyond
2 the track edges of the free layer.

1 14. A head as recited in claim 10, further comprising at least one antiferromagnetic
2 (AFM) layer positioned outside the track edges of the free layer in a direction
3 parallel to the ABS, each AFM layer being for pinning a magnetic orientation of
4 portions of the pinned layer closest thereto and positioned outside the track edges
5 of the free layer.

1 15. A head as recited in claim 10, wherein the head forms part of a GMR head.

1 16. A head as recited in claim 10, wherein the head forms part of a CPP GMR sensor.

1 17. A head as recited in claim 10, wherein the head forms part of a CIP GMR sensor.

1 18. A head as recited in claim 10, wherein the head forms part of a tunnel valve
2 sensor.

1 19. A magnetic storage system, comprising:
2 magnetic media;
3 at least one head for reading from and writing to the magnetic media, each head
4 having:
5 a sensor having the structure recited in claim 1;
6 a write element coupled to the sensor;
7 a slider for supporting the head; and
8 a control unit coupled to the head for controlling operation of the head.

1 20. A magnetic storage system, comprising:
2 magnetic media;
3 at least one head for reading from and writing to the magnetic media, each head
4 having:
5 a sensor having the structure recited in claim 10;
6 a write element coupled to the sensor;
7 a slider for supporting the head; and
8 a control unit coupled to the head for controlling operation of the head.